# Chelsio T4-based 10GbE Unified Wire Adapters for IBM Intelligent Cluster and iDataPlex

## IBM System x at-a-glance guide

The Chelsio dual-port and quad-port Unified Wire adapters for IBM® Intelligent Cluster and IBM iDataPlex™ are 10 Gigabit Ethernet adapter with PCI Express host bus interface optimized for cloud computing, HPC, virtualization, storage, and other data center applications. These adapters are based on fourth-generation (T4) technology from Chelsio, provide the highest 10GbE performance available, and dramatically lower host-system CPU communications overhead with on-board hardware that offloads TCP/IP, iSCSI, FCoE, and iWARP RDMA processing from its host system. As a result, the server can achieve increased bandwidth, lower latency, and lower power consumption.

Figure 1 shows the Chelsio T440-CR Quad-Port (SFP+) 10GbE PCI-E 2.0 Adapter.

Figure 1. Chelsio T440-CR Quad-Port (SFP+) 10GbE PCI-E 2.0 Adapter

## Did you know

Chelsio implements the concept of the unified wire, enabling the convergence of server networking, storage networking, and cluster computing interconnects onto a single fabric that enables TCP, UDP, iSCSI, iWARP, and FCoE offload with SR-IOV, EVB/VN Tag, and data center bridging (DCB).

These Chelsio adapters are part of the IBM Intelligent Cluster solution. IBM Intelligent Cluster is your key to a fully integrated HPC solution. IBM clustering solutions include servers, storage, and industry-leading interconnects that are factory-integrated, fully tested, and delivered to your door, ready to plug into your data center, all with a single point of contact for support.

## Part number information

Table 1 lists part numbers and feature codes.

Table 1. Ordering part number and feature code

| Description | IBM part number | Feature code | Chelsio part number |
|---|---|---|---|
| Chelsio T420-CR Dual-port (SFP+) 10GbE PCI-E 2.0 Adapter | 46M2237 | 3025 | T420-CR |
| Chelsio T420-SO-CR Dual-port (SFP+) 10GbE PCI-E 2.0 Adapter | 81Y8021 | A0R2 | T420-SO-CR |
| Chelsio T440-CR Quad-Port (SFP+) 10GbE PCI-E 2.0 Adapter | 46M2241 | 3026 | T440-CR |
| Chelsio T420-BCH Dual-port 10GbE CFFh Expansion Card | 46M2245 | 3027 | T420-BCH |

Figure 2 shows the Chelsio T420-BCH Dual-port 10GbE CFFh Expansion Card for IBM BladeCenter®.

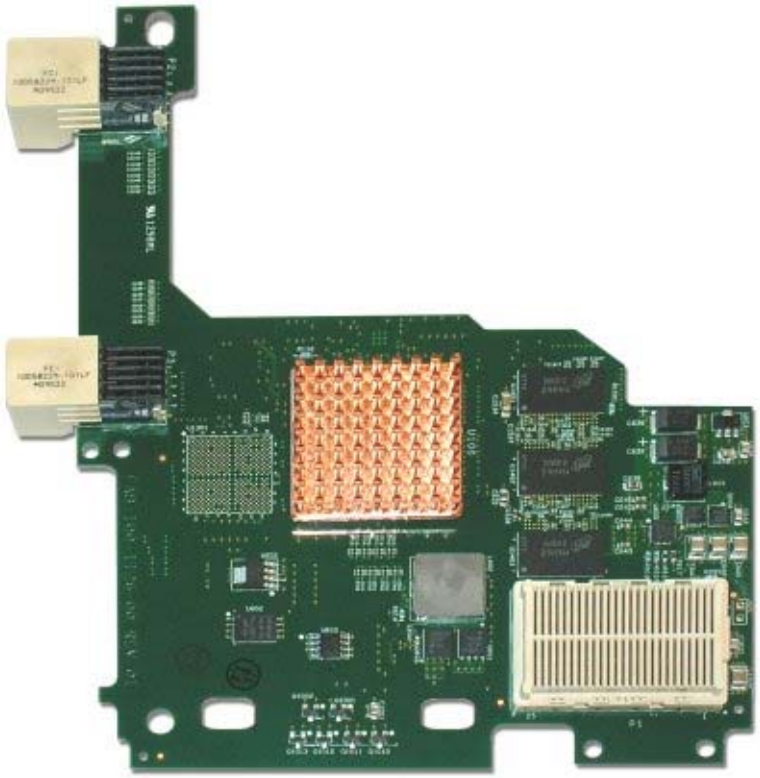

Figure 2. Chelsio T420-BCH Dual-port 10GbE CFFh Expansion Card

## Features

Chelsio is enabling a unified wire for LAN, SAN, and cluster traffic. This unified wire was made possible by the high bandwidth and low latency of 10GbE combined with storage and cluster protocols operating over TCP/IP (iSCSI, FCoE, and iWARP, respectively). In parallel, operating systems and hypervisors have incorporated native support for iSCSI, and database applications now support file-based storage protocols such as NFS as an alternative to SANs. Expanding its unified wire approach, Chelsio has added Fibre Channel over Ethernet (FCoE) hardware support to the new T4-based adapters. FCoE provides a transition path from legacy SANs to converged networks.

Chelsio Unified Wire 10GbE adapters for IBM Intelligent Cluster and iDataPlex have the following features:

- PCI Express Gen2 x8
- Low latency
- Supports up to 1M connections
- Full TCP and UDP offload
- TCP chimney
- Full iSCSI, FCoE offload
- Full iWARP RDMA offload
- EVB, VEPA
- PCI-SIG SR-IOV
- Integrated media streaming offload
- Hardware-based firewall in the cloud
- Traffic filtering and management

## Applications

The Chelsio Unified Wire 10GbE adapters are ideally suited for use in the solutions listed below.

Data center networking:

- Scale up servers and NAS systems.
- Link servers in multiple facilities to synchronize data centers.
- Consolidate LAN, SAN, and cluster networks.

Cloud computing:

- Virtualization features to maximize cloud scaling and utilization
- Runs InfiniBand, Fibre Channel apps unmodified on Ethernet
- Cloud ready functional and management features
- QoS and traffic management

Networked storage:

- Enable high-performance NAS systems and Ethernet-based IP SANs.
- Develop shared-storage systems providing both file-level and block-level services.

High performance computing:

- Very low latency Ethernet.
- Increase cluster fabric bandwidth.
- Deploy Ethernet-only networking for cluster fabric, LAN, and SAN.

## Comparison of the adapter cards

Table 2 compares the Chelsio Unified Wire 10GbE adapters.

Table 2. Ordering part numbers and feature codes

| Adapter | T420-CR | T440-CR | T420-BCH | T420-SO-CR |
|---|---|---|---|---|
| IBM part number | 46M2237 | 46M2241 | 46M2245 | 81Y8021 |
| Number of ports | 2x 10 G | 4x 10 G | 2x 10 G | 2x 10G |
| Connector type | SFP+ cage | SFP+ cage | BladeCenter CFFh | SFP+ cage |
| Host interface | PCIe x8 Gen 2 | PCIe x8 Gen 2 | PCIe x8 Gen 2 | PCIe x8 Gen 2 |
| Form factor | Low Profile | Half size | BladeCenter CFFh | Low profile |
| Connection capacity | 32 K | 32 K | 32 K | 128 |
| Full TCP offload | Yes | Yes | Yes | Yes |
| Full UDP/multicast offload | Yes | Yes | Yes | No |
| Full iWARP RDMA offload | Yes | Yes | Yes | No |
| Full iSCSI offload | Yes | Yes | Yes | Yes |
| Full FCoE offload | Yes | Yes | Yes | Yes |
| SR-IOV, VEB/VEPA | Yes | Yes | Yes | Yes |
| Op-iSCSI | Yes | Yes | Yes | Yes |
| Op-FCoE | Yes | Yes | Yes | Yes |
| Power | 11.94 W | 12.65 W | 12.60 W | 8.86 W |
| Recommended for | Unified Wire: RDMA, TOE, NIC, iSCSI, FCoE virtualization | Unified wire: RDMA, TOE, NIC, iSCSI, FCoE virtualization | Unified Wire: RDMA, TOE, NIC, iSCSI, FCoE virtualization | Unified Wire: NIC, TOE, iSCSI, FCoE virtualization |

## Specifications

The Chelsio Unified Wire 10GbE adapters have the specifications listed below.

Host interface:

- PCI Express Gen2 x8
- MSI-X, MSI, and support for legacy pin interrupts

Network interfaces:

- 10GBASE-SR short-reach optics (850 nm)
- 10GBASE-LR long-reach optics (1310 nm)

High-performance RDMA:

- Low-latency and line-rate bandwidth
- Enhanced RDMA primitives
- iWARP support on Linux OFED
- Microsoft Network Direct support

UDP and multicast offload:

- UDP Sockets API
- Low user-to-user latency
- Multicast replication on ingress or egress

Virtualization:

- PCI-SIG SR-IOV
- 128 virtual functions (VF), 8 PF
- 144 port virtual switch
- EVB, VEPA, Flex10, VNTag
- 336 virtual MAC addresses

FCoE:

- Full HBA FCoE (initiator or target)
- Open-FCoE Offload (initiator)
- CRC32 offload generation and verification
- Ingress and egress access control list (ACL)

iSCSI acceleration:

- Full iSCSI initiator and target mode stack
- CRC32 offload generation and verification
- iSCSI proxy switching based on SCSI CDB
- Full HBA offload

TCP/IP full offload:

- Full TCP implementation including IPv4 and IPv6
- Microsoft Chimney support
- Extensive RFC compliance, fully featured stack
- Full TCP proxy between any set of connections
- VLAN support of up to 4096 different VLAN IDs
- Load balancing and failover capabilities

Stateless offloads:

- TCP/UDP checksum offload for IPv4 and IPv6
- TSO, LSO, and GSO for IPv4 and IPv6
- VLAN filtering, insertion, and extraction
- Line-rate packet filtering and attack protection
- Fine granularity time stamping (down to 4 ns)
- Ethernet routing (packet header rewrite)
- Packet tracing and packet sniffing

Ethernet standards support:

- IEEE 802.3ae (10 GbE)
- IEEE 802.3z (1 GbE) compliant
- IEEE 802.IP priority
- IEEE 802.IQ VLAN tagging
- IEEE 802.1Qbg EVB/VEPA
- IEEE 802.1Qbh VNTag
- IEEE 802.3x flow control
- IEEE 802.3ad load-balancing and failover
- Ether II and 802.3 encapsulated frames
- Multiple MAC addresses per interface
- Jumbo frames up to 9.6 Kbytes

Figure 3 shows the Chelsio T420-CR Dual-port (SFP+) 10GbE PCI-E 2.0 Adapter.

Figure 3. Chelsio T420-CR Dual-port (SFP+) 10GbE PCI-E 2.0 Adapter

## Physical and environmental specifications

The specifications are:

- Dimensions without bracket:
  - T420-BCH - 4.92" x 6.26" or 12.5 cm x 15.9 cm
  - T420-CR - 6.6 in. x 2.71 in. or 16.8 cm x 6.9 cm
  - T420-SO-CR - 4.0 in. x 2.7 in. or 10.2 cm x 6.9 cm
  - T440-CR - 6.6 in. x 3.95 in. or 16.8 cm x 10.0 cm
- Operating temp: 0 to 55 °C or 32 to 131 °F
- Operating humidity: 5 to 95%

Figure 4 shows the Chelsio T420-SO-CR Dual-port (SFP+) 10GbE PCI-E 2.0 Adapter.

Figure 4. Chelsio T420-SO-CR Dual-port (SFP+) 10GbE PCI-E 2.0 Adapter

## Supported servers

The Chelsio Unified Wire 10GbE adapters are supported in the IBM Intelligent Cluster program,, as listed in Table 3.

Table 3. Supported servers in the IBM Intelligent Cluster program

| | Part number | x3550 M3 | x3650 M3 | x3690 X5 | x3755 M3 | x3850 X5 | HS22 | HS22V | LS22 | LS42 | dx360 M2 | dx360 M3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chelsio T420-CR Dual-port (SFP+) 10GbE PCI-E 2.0 Adapter | 46M2237 | Y | Y | Y | Y | Y | N | N | N | N | Y | Y |
| Chelsio T420-SO-CR Dual-port (SFP+) 10GbE PCI-E 2.0 Adapter | 81Y8021 | Y | Y | Y | Y | Y | N | N | N | N | Y | Y |
| Chelsio T440-CR Quad-Port (SFP+) 10GbE PCI-E 2.0 Adapter | 46M2241 | Y | Y | Y | Y | Y | N | N | N | N | Y | Y |
| Chelsio T420-BCH Dual-port 10GbE CFFh Expansion Card | 46M2245 | N | N | N | N | N | Y | Y | Y | Y | N | N |

## Supported operating systems

The Chelsio adapters support the following operating systems. Support is for both TOE and NIC mode, unless otherwise stated, along with OFED stack, SR-IOV (vNIC), and other functionalities.

- Red Hat Enterprise Linux 5 update 4 kernel (RHEL5.4), 2.6.18-164.el5 (32-bit and 64-bit)
- Red Hat Enterprise Linux 5 update 5 kernel (RHEL5.5), 2.6.18-194.el5 (32-bit and 64-bit)
- Red Hat Enterprise Linux 6 base kernel (RHEL6), 2.6.32-71.el6 (32-bit and 64-bit)
- SUSE Linux Enterprise Server 11 SP1 kernel (SLES11SP1), 2.6.32.12-0.7 (32-bit and 64-bit)
- Windows 7 (32-bit and 64-bit)
- Windows Server 2008 R2 (64-bit)

See the Chelsio driver readme file (bundled with driver and available on the driver download website) for the latest information about the specific versions and service packs that are supported.

Go to http://www.chelsio.com/support for all Chelsio driver downloads.

## Related publications

For more information, see the following resources:

- Chelsio Adapters driver download, installation, configuration, troubleshooting, and support
  http://service.chelsio.com/ibm.html
- IBM System Cluster 1350™ Information Center
  http://publib.boulder.ibm.com/cluster/

# Notices

This information was developed for products and services offered in the U.S.A.

IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service. IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

*IBM Director of Licensing, IBM Corporation, North Castle Drive, Armonk, NY 10504-1785 U.S.A.*

**The following paragraph does not apply to the United Kingdom or any other country where such provisions are inconsistent with local law:** INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you. This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this IBM product and use of those Web sites is at your own risk.IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you. Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources. IBM has not tested those products and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products. This information contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples include the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to the names and addresses used by an actual business enterprise is entirely coincidental.

Any performance data contained herein was determined in a controlled environment. Therefore, the results obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurement may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

COPYRIGHT LICENSE:

This information contains sample application programs in source language, which illustrate programming techniques on various operating platforms. You may copy, modify, and distribute these sample programs in any form without payment to IBM, for the purposes of developing, using, marketing or distributing application programs conforming to the application programming interface for the operating platform for which the sample programs are written. These examples have not been thoroughly tested under all conditions. IBM, therefore, cannot guarantee or imply reliability, serviceability, or function of these programs.

**© Copyright International Business Machines Corporation 2011. All rights reserved.**
Note to U.S. Government Users Restricted Rights -- Use, duplication or disclosure restricted by GSA ADP Schedule Contract with IBM Corp.

This document was created or updated on April 25, 2011.

Send us your comments in one of the following ways:

- Use the online **Contact us** review form found at:
  ibm.com/redbooks
- Send your comments in an e-mail to:
  redbook@us.ibm.com
- Mail your comments to:
  IBM Corporation, International Technical Support Organization
  Dept. HYTD Mail Station P099
  2455 South Road
  Poughkeepsie, NY 12601-5400 U.S.A.

This document is available online at http://www.ibm.com/redbooks/abstracts/tips0825.html .

# Trademarks

IBM, the IBM logo, and ibm.com are trademarks or registered trademarks of International Business Machines Corporation in the United States, other countries, or both. These and other IBM trademarked terms are US registered or common law trademarks owned by IBM at the time this information was published. Such trademarks may also be registered or common law trademarks in other countries. A current list of IBM trademarks is available on the Web at http://www.ibm.com/legal/copytrade.shtml

The following terms are trademarks of the International Business Machines Corporation in the United States, other countries, or both:

1350™
BladeCenter®
IBM®
iDataPlex™
Redpaper™
Redbooks (logo)®
System x®

The following terms are trademarks of other companies:

Microsoft, Windows, and the Windows logo are trademarks of Microsoft Corporation in the United States, other countries, or both.

Linux is a trademark of Linus Torvalds in the United States, other countries, or both.

Other company, product, or service names may be trademarks or service marks of others.